

SUPPORT FOR THE AMENDMENTS

The present amendment cancels claims 1-7, and adds new claims 8-18.

Claims 1-7 have been cancelled, and new claims 8-18 have been added, to place these claims in a better condition for allowance. Support for these amendments is provided by the originally filed claims and specification.

Support for newly added claim 8 is found at specification page 2, lines 3-15, page 4, lines 8-11, 16-17 and 24, page 5, lines 1-4, as well as original claims 1-3.

Support for newly added claim 9 is found at specification page 7, lines 10-12.

Support for newly added claim 10 is found at claim 2 of the Article 34 amended sheet, as originally filed.

Support for newly added claims 11-12 is found at specification page 2, lines 16-21, page 3, lines 21-24, page 4, lines 20-22, as well as original claim 4.

Support for newly added claims 13 and 15 is found at specification page 3, lines 1-4, page 4, lines 8-11, as well as original claim 6.

Support for newly added claims 14 and 16-18 is found at specification page 8, lines 13-18, as well as original claims 5 and 7.

It is believed that these amendments have not resulted in the introduction of new matter.

REMARKS

Claims 8-18 are currently pending in the present application. Claims 1-7 have been cancelled, and new claims 8-18 have been added, by the present amendment.

The rejections of now cancelled: (1) claim 1 under 35 U.S.C. § 102(b) as being anticipated over Yuasa (U.S. Patent 2002/0048964); and (2) claims 2-4 under 35 U.S.C. § 103(a) as being obvious over Yuasa in view of Tsuda (U.S. Patent 6,335,546), are obviated by amendment, with respect to new claims 8-18.

New claim 8 recites a method for growing a thin bipolar gallium nitride film on a sapphire substrate, said method comprising: subjecting the sapphire substrate to H₂ cleaning; and treating the sapphire substrate, which has been subjected to H₂ cleaning, with a nitric acid solution having a nitric acid concentration of 6-63 %, wherein said treating is carried out at a temperature of 40⁰C for a period of 0 minutes to 10 minutes, whereby the thin bipolar gallium nitride film having a Ga face (+c) and a N face (-c) is grown on the sapphire substrate.

Yuasa describes a method for forming a gallium nitride semiconductor layer comprising: providing a substrate (e.g., glass or sapphire) having a portion which acts as a growth suppressing film on an outermost surface thereof; growing a thin gallium nitride growth promoting film on the substrate at a growth temperature of about 600⁰C; etching the thin gallium nitride growth promoting film to form a striped pattern with hot nitric acid (about 200⁰C); and growing a thick gallium nitride film on the thin gallium nitride growth promoting film at a growth temperature of about 1000⁰C (See e.g., abstract, [0012], [0019], [0048], [0056], [0057], [0061]).

Tsuda describes a nitride semiconductor structure and a process of producing the same comprising: thermal cleaning of a sapphire substrate having a c plane growth surface for about 10 minutes with H₂ gas at a temperature of about 1,025⁰C; and growing a nitride semiconductor film on the c plane growth surface at a growth temperature of about 1,000⁰C (See e.g., abstract, column 3, lines 31-35, column 9, lines 30-62).

According to the method of present invention, the Ga face (+c) is obtained by H₂ cleaning of the sapphire substrate, and the N face (-c) is obtained by H₂ cleaning of the sapphire substrate and nitriding at a low temperature of 40°C for a period of 0 minutes to 10 minutes (See e.g., page 4, line 8-14, page 5, lines 1-4).

As discussed in the present specification, conventional methods cannot significantly control the polarity of the thin nitride film because the high temperatures (e.g., 750-1,100°C or higher) typically associated therewith cancel out the effects of the previous substrate surface treatments (See e.g., page 1, lines 14-18, page 5, lines 4-8).

Yuasa describes growing a thin gallium nitride growth promoting film on the substrate at a high growth temperature of about 600°C.

Tsuda describes thermal cleaning of a substrate with H₂ gas at a high temperature of about 1,025°C and growing a nitride semiconductor film on the substrate at a high growth temperature of about 1,000°C.

Yuasa and Tsuda, when considered alone or in combination, fail to disclose or suggest treating a sapphire substrate, which has been subjected to H₂ cleaning, with a nitric acid solution at a temperature of 40°C for a period of 0 minutes to 10 minutes, whereby a thin bipolar gallium nitride film having a Ga face (+c) and a N face (-c) is grown on the sapphire substrate, as presently claimed. A skilled artisan would not have arrived at the method of the present invention based on the disclosures of Yuasa and Tsuda, absent impermissible hindsight reconstruction. As a result, Yuasa and Tsuda fail to anticipate or render obvious the method of the present invention.

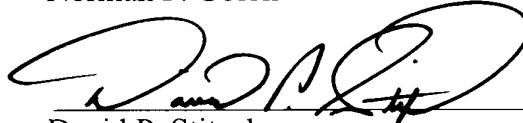
The rejection of claims 1-4 under 35 U.S.C. § 112, second paragraph, is obviated by amendment with respect to the cancellation of said claims. Withdrawal of this ground of rejection is respectfully requested.

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In conclusion, Applicants submit that the present application is now in condition for allowance and notification to this effect is earnestly solicited.

Respectfully submitted,

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